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ILLUMINATING ENGINEER NC RESEARCH INSTITUTE ANNUAL REPORT 1966. A REVIEW OF RESEARCH ACTIVITIES AND A VIEW OF NEW GOALS IN A LUMINOUS ENVIRONMENT.

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Several of the more familiar Illuminating Engineering Research Institute projects which have been chronicled progressively during the past several years are discussed in this report. Those elaborated on are--(1) visual performance and illumination, (2) roadway visual tasks, (3) color preference studies, (4) glare from large sources, (5) discomfort glare data analysis, (6) transitional adaptation, and (7) standardized test objectives. Photographs, diagrams and charts are provided. (RK)

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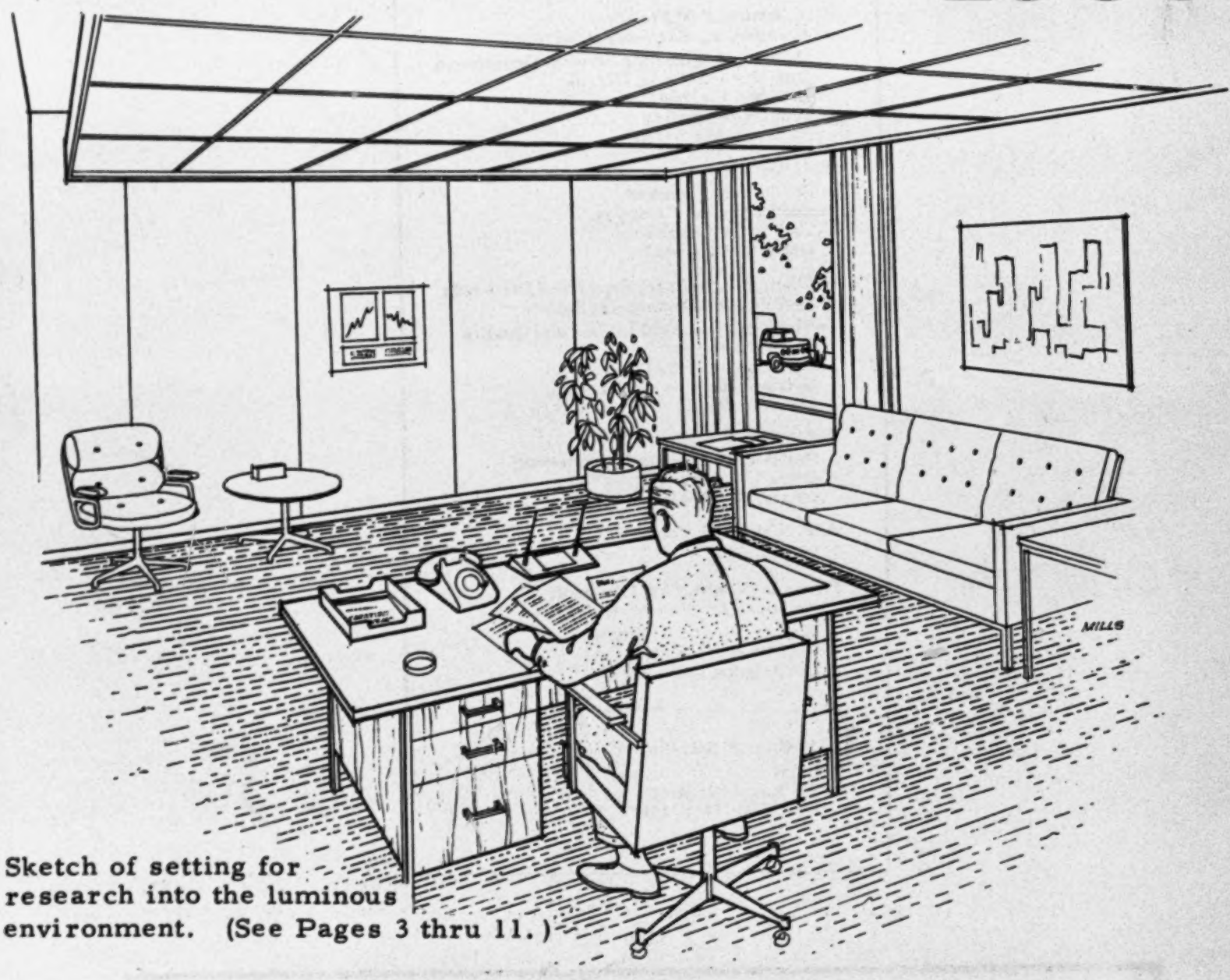
ILLUMINATING ENGINEERING Research Institute

ANNUAL REPORT 1966



Sketch of setting for research into the luminous environment. (See Pages 3 thru 11.)

A review of research activities and a view of new goals in a luminous environment

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ILLUMINATING ENGINEERING

Research Institute

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1965-1966

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Color combination used in printing the outside cover won second-highest preference in Dr. Harry Helson's studies (Project 48). Combination with highest preference rating was used on the cover of the 1965 report.

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ILLUMINATING ENGINEERING
Research Institute

345 East 47th Street, New York, N.Y.
10017

FOREWORD

This is an annual report that finds the Illuminating Engineering Research Institute at a turning point in its road -- a point between recorded achievements and exciting new challenges in the immediate future.

The Institute has come a long way since it was organized in 1944. It has made an impressive number of significant contributions to practical knowledge about light and sight. Many of these advances have been recent. But none would have been possible without the determined efforts of early researchers who dutifully provided concepts, tools and groundwork without any real assurance that their efforts were worth the candle.

But of course they were. How valuable they were will be shown in the broad review on the following pages. Also you will find there a preview of what might lie ahead, and a look at the road the Institute expects to travel to substitute clarity for what is now only dimly seen.

We hope that this report will inspire not only your continuing interest in our work but will persuade you also that we must continue with the exciting program which we believe justifies broad understanding and assistance. And we hope it will encourage you to become an enthusiastic supporter within the industry, giving the aid so necessary for the fulfillment of this program.

The Illuminating Engineering Research Institute has achieved much for the industry in the past 22 years at minimal cost. But research is expensive. Much more will be achieved with more adequate financial support. We need the generous help of all our friends. We hope we shall continue to have yours.

John W. Ferree, M.D., M.P.H.
Chairman, Board of Trustees

July 14, 1967

1966 ANNUAL REPORT

REVIEW - AND AN ESTIMATE OF THE FUTURE

The Illuminating Engineering Research Institute has crossed the borderline of legal adulthood -- is in fact 22 years old -- and has found itself face to face with the problem of having grown up. It was an unusual child and teenager. Thus it comes to maturity with a long and impressive record of accomplishments, a program for future action and a need to decide what can be done next in the fulfillment of basic objectives.

In the course of this report we shall review, as is expected of the annual roundup, what has happened during the past twelve months. But this year's report will differ from earlier ones by indicating that several of the more familiar IERI projects, chronicled progressively during the past several years, are now "topping out". Some have reached their peaks; others are fast approaching their climaxes.

Thanks to its active youth, the IERI can do what many young adults wish they could do -- look back at its years of effort and count up its accomplishments with pride. The penalty for this privilege is

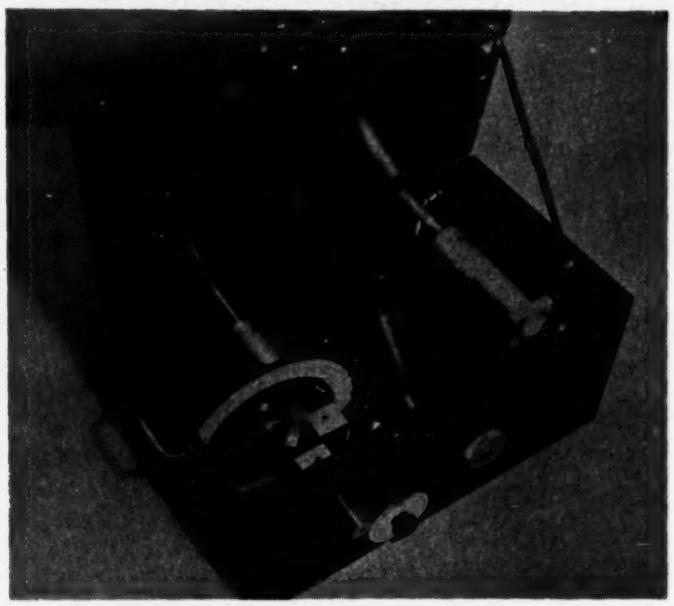
the realization that most of the early goals have been achieved and that new goals and new directions must now be sought.

So, in the course of this prelude to the annual accounting, we intend to take a broader look back over the years to recall some of IERI's major accomplishments -- and also to look into the future to assess the lighting problems of tomorrow in the face of many hazy unknowns.

The perquisite to progress in the Research Institute's history was the development of the tools with which to work. The Institute's first accomplishments, it will be admitted generally, was its ability to make possible a progression of instruments and measuring devices without which many of the studies which have brought prestige to this relatively young research organization would not have been possible.

Here are some of the key instruments developed:

1. The Visual Task Evaluator, which enables the lighting engineer to establish an identify between a field viewing task and a laboratory task for which lighting levels for effective viewing had already been scientifically established.



VISUAL TASK EVALUATOR developed by Dr. H. Richard Blackwell and associates as part of lighting-evaluation method.

2. The Field Task Simulator which made it possible to assess in the laboratory such variations in viewing as motion, poor contrast and the effects of unexpected appearances.

3. The Cottrell Meter, the first instrument for measuring veiling reflections.

4. The Pritchard Glare Meter, which makes possible the measurement of disability glare in the field.

With these developments in hand, the door was opened for a parade of progress in lighting research. Among the achievements of which the IERI may well be proud are the following:

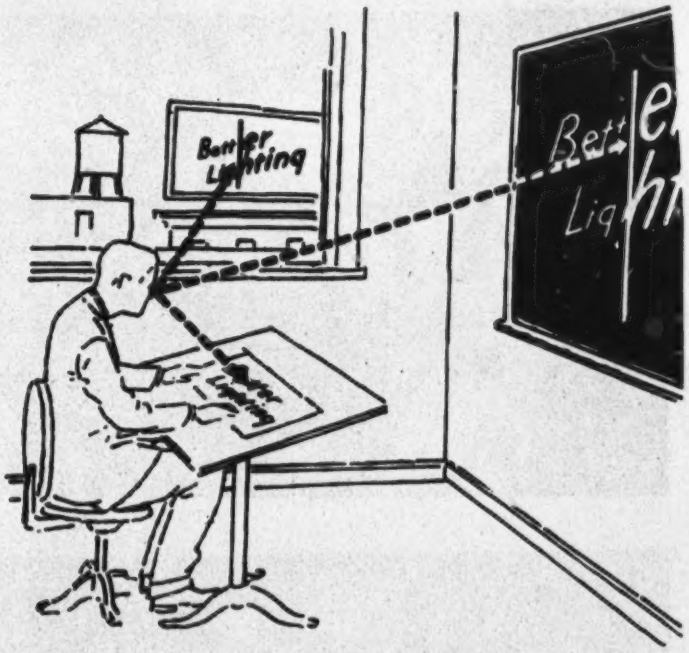
A system for determining the amount of light required to view tasks effectively, resulting in new, improved levels of illumination in practice;

A measuring technique of veiling reflections in the working task which showed a waste of two-thirds of the light developed by some overhead systems;

Basic facts governing the loss of ability to see when glancing from one brightness level to another;

A rating system showing the degress of pleasantness of various color schemes under currently-used lighting systems;

Basic facts regarding the effect of glare from large sources on the ability to see comfortably;



CHANGE OF BRIGHTNESS LEVEL causes a loss of ability to see.

Determination of new values for seeing hazardous objects on roadways.

All of these advances have been reported in previous annual reports of the Illuminating Engineering Research Institute, and details can readily be found. It is not necessary to look very far, however, for the practical results of most of these developments. They are at hand at every turn, forming the basis of modern-day lighting practices for our working hours and for our hours of diversion and relaxation.

The lighting industry may well be proud of the new knowledge it has been able to apply for the benefit of the men, women and children of our nation. We may well be ahead of other nations on some developments, although it is the intent of the IERI, through its frequent international symposia, to keep an even balance of international lighting

SIMULATED OFFICE serves to test glare from contemporary large lighting sources.

DRIVER'S EYE VIEW of hazardous objects for which lighting values must be determined.

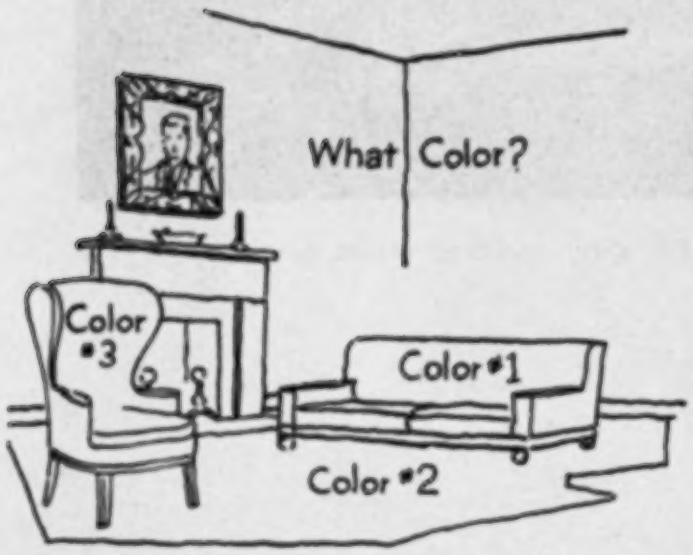
knowledge by gathering the discoveries of research scientists in other nations and, in turn, making available to them the information developed by investigators here.

But to the progressive lighting scientist, more important than what we have done is what we still must do. And it is at this stage of progress in the field of lighting research that we find ourselves today.

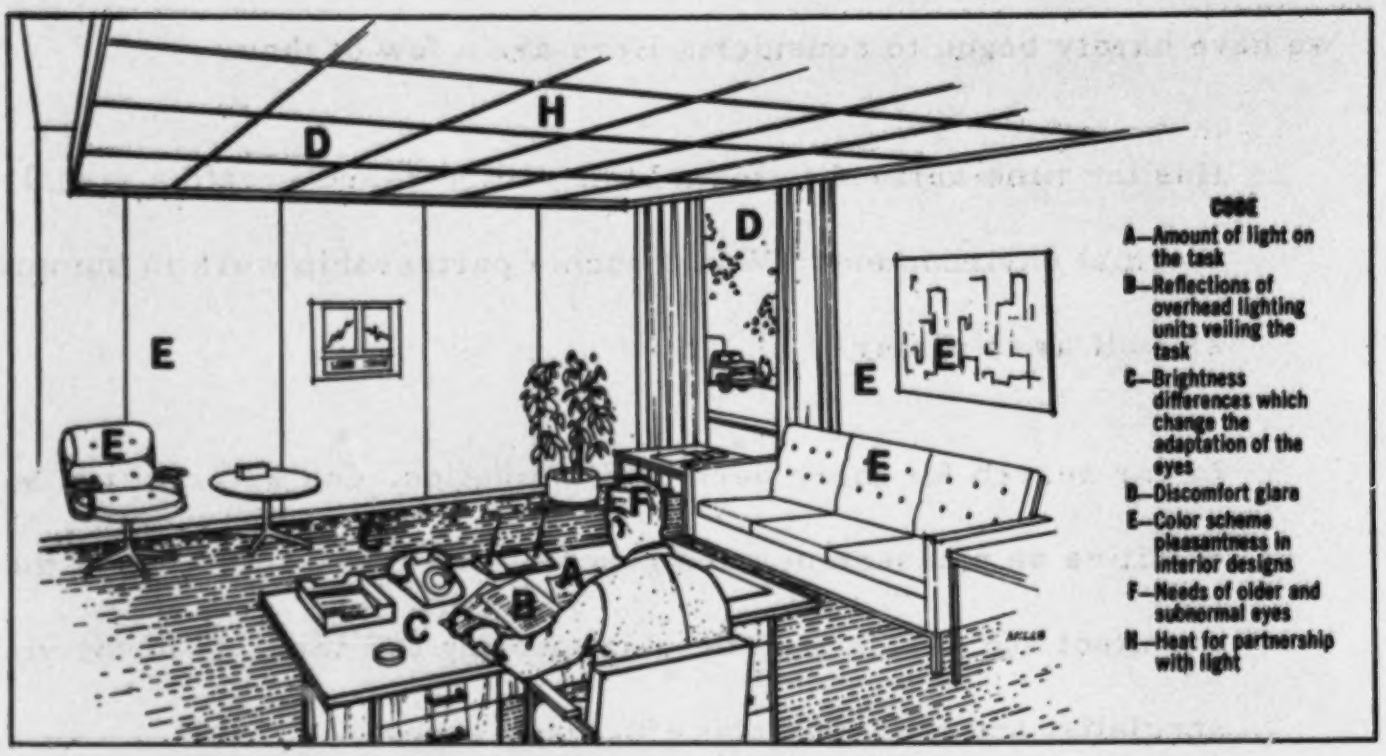
We now know, through the system developed for the IERI by Dr. H. Richard Blackwell and his colleagues, how much light the normal 20-year-old adult requires to see a given task effectively. The studies that resulted in this knowledge took several years to complete and were a key portion of our program from 1950 to 1958. In the past few years we have begun to refine this system and to probe other problems of light and sight.

In our on-going program our researchers are searching for basic knowledge from which criteria of design will develop. Some of the questions these on-going studies are expected to answer are:

How do the specifications differ for those who are older than



COLOR COMBINATIONS -- Some colors go well together but others do not. Studies have determined the degree of pleasantness of various color schemes.



ELEMENTS IN THE ENVIRONMENT -- Gathered together above are various factors that affect seeing and living in today's society. Code identifies factors that designers must consider.

20 years?

How much more light is required by those whose vision is something less than normal?

What are the optimum answers -- the criteria of design -- to other problems such as possible glare from luminous ceilings and daylighting?

What are the losses involved in transitional adaptation? Or what are the limitations in the variations of brightness in the field of view?

But these are not yet the big gaps in the specialized literature on which the lighting engineer depends. The answers he is beginning to look for now, and that he will be vitally needing tomorrow, respond to questions

we have hardly begun to consider. Here are a few of them:

Has the time arrived to team light with heat and create a visual-thermal environment? Would such a partnership work in summer as well as in winter?

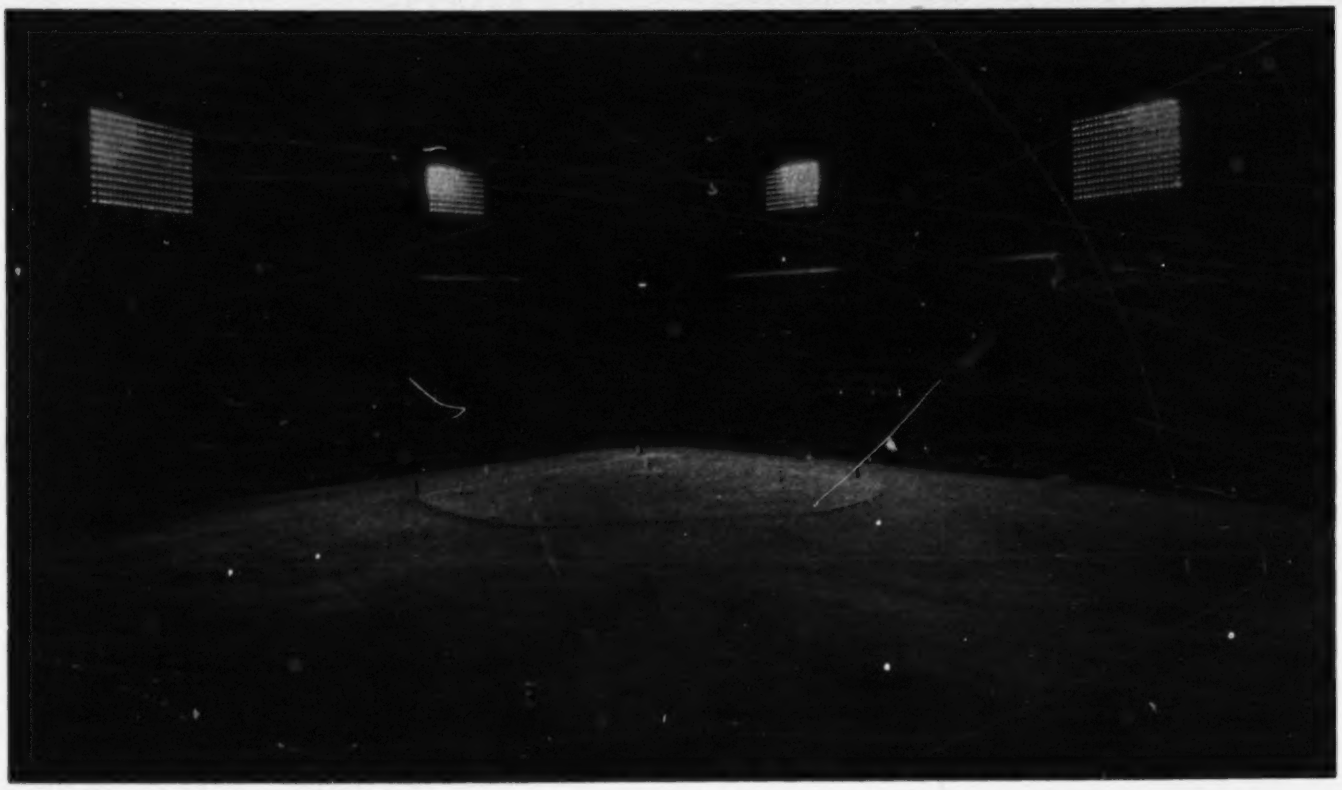
In our search for more perfect illumination, can we preserve such qualities as pleasantness and grace of line in the interests of the architect and designer while also meeting the demands of the vision specialist and the industrial efficiency expert?

What is the cost of seeing in terms of nervous tension and dissipated energies leading to accumulated fatigue and possible more-rapid deterioration of vision?

How can lighting serve more effectively in solving the more and more alarming problem of death and maiming in accidents on our highways?

In the emerging American society which promises more leisure in our working years and that gives us, as well, more years for retirement, has the lighting engineer contributed all that he can to enhance the living environment and improve the services that will help to satisfy our new potential for recreation and diversion?

We cannot answer these questions with any degree of certainty today. Moreover, we have no assurance at this moment in our activity as an independent or "non-captive" research authority that we shall



LIGHT AND RECREATION -- Optimum visibility of the ball (or puck or other object) brings heightened pleasure to spectators in the stands and to TV audiences.

ever be able to provide the needed answers -- unless.....

Unless we recognize that finding the answers to tomorrow's problems of light and sight is as much the province of the IERI as was finding the answers to today's.....

Unless we begin now to develop the techniques, the manpower and the planning to be ready to play our role, if we agree to accept it.....

And unless we make major efforts to find the financial resources that will enable us to undertake this broad but unquestionably necessary extension of our program.

EUROPEAN SURVEY

There was no overseas symposium during the year covered by this report, but the Secretary of the IERI, C. L. Crouch, took advantage of a speaking engagement in England to inspect a few important lighting research projects on the Continent.

Mr. Crouch was a speaker at the bi-annual meeting of the British Illuminating Engineering Society at Harrogate. In his talk he presented the concept that Man's sensors form an integrated system of body communications, his muscular and nervous reactions resulting from sound and touch and sight. In view of this intricate interweaving of senses, Mr. Crouch suggested that the illuminating engineer must enlarge his field of interests and expand his observations to encompass "the whole man". As a result, the engineer's designs for a luminous environment will have to be integrated with Man's thermal and sonic environments.

Because light is the medium for the greatest amount of communication of knowledge and for guiding productive effort, it is appropriate, the secretary pointed out, for the illuminating engineer to take the lead in studying and providing for the total effect of these various influences on Man, and in meeting the demands that these influences create.

Following this appearance, Mr. Crouch traveled to The Netherlands. At Eindhoven he examined a roadway lighting test site at the N. V. Philips Gloeilampenfabrieken. At the time of the inspection the facilities were being readied for use. A full-scale outdoor street had been constructed and equipped with a control building and with a highly flexible lighting installation capable of using any luminaire at any spacing-and-mounting-height relationship. He visited the laboratory at night to observe how the equipment functioned. From a control building he viewed a car driven through the specimen street which, he reported, is laid out so that a car can approach the building and leave it via a roadway around the structure.

In Rotterdam he inspected the lighting of a complex roadway interchange involving a number of overpasses and underpasses designed to accommodate automobile roads and cycle and pedestrian paths. The entire complex was lighted simultaneously from 120-foot towers, each topped by a circular bank of newly-developed sodium-discharge downlights. The installation, which developed 150 lumens per watt, was attractive and effective, Mr. Crouch reported.

From Rotterdam he traveled to Karlsruhe, visiting Prof. Werner Adrian at the Lichttechnischen Institut der Technischen Hochschule and serving as an observer in a discomfort-glare test on a simulated road-

way. The tests will be reported in an early issue of "Illuminating Engineering".

He went then to Frankfurt, Germany, visiting a trial installation in which sodium and mercury lighting sources were used in alternate luminaires at a height of 35 feet to test suitable roadway lighting and possible reduction of discomfort glare. One group of luminaires was shaded to a greater extent than the second to show the effect of less glare.

The luminaire with the larger amount of shading proved to be the more comfortable installation. The sodium lights, Mr. Crouch said, appeared to be more pleasing than the mercury.

YEAR IN REVIEW

VISUAL PERFORMANCE AND ILLUMINATION (Project 30 - 65): Dr. Smith's study of eye movements continued with new electronic and optical equipment being designed for an "eye marker" to record the eye's action. He also proceeded with supplemental experiments on eye movements in viewing tasks in the field. Meanwhile Mrs. Blackwell developed laboratory equipment to measure ocular stray light which is part of deterioration in older people, of ability to see.

ROADWAY VISUAL TASK (Project 47 - 65): Mrs. Blackwell has also taken over this project because the previous researcher had other unanticipated commitments. She reported progress during the year, having improved criteria for study of roadway lighting needs.

COLOR PREFERENCE STUDY (Project 48): Dr. Helson is still developing results from analyzing the 156,000 reactions he collected in his study of color combinations. A report is due soon.

GLARE FROM LARGE SOURCES (Project 59 - 65): The studies during the past year dealt with the combining of glare effects from a number of sources off of the line of sight. Results are to be analyzed shortly. Analysis of previous results of the Cornell project have been completed by Dr. R.A. Hopkinson of England.

DISCOMFORT GLARE DATA ANALYSIS (Project 59 A.S. 1 & 2): Dr. Fry is attempting to correlate the findings of several prominent researchers, American and European, in the area of discomfort glare.

TRANSITIONAL ADAPTATION (Project 63 - 65): This is Dr. Boynton's third series of studies and attempts to measure the amount of time required to find a specific detail among many details. The data have been collected but not yet interpreted in this, the "running tau" experiment.

STANDARDIZED TEST OBJECTS (Project 70 A.S. 4 & 5): Research is proceeding in the study of handwriting samples made with a mechanical device and therefore relatively standardized. Various light distributions, from sidewall to concentrated downlights, are being made.

Visual Performance and Illumination

PROJECT 30-65

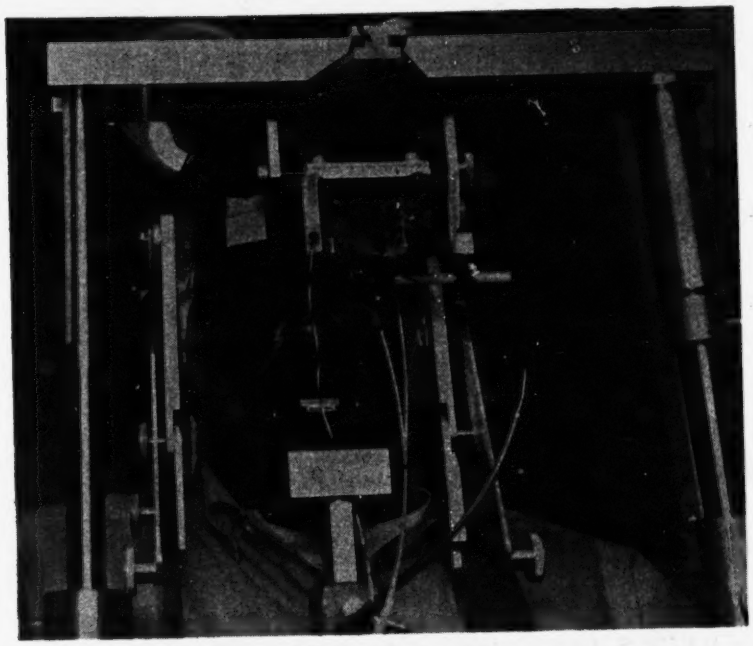
Two studies were conducted during the past year in this project at the Vision Research Institute, Ohio State University. One was a study of eye movements, carried on by Dr. Stanley Smith, professor of biophysics at O. S. U., and principal investigator for the IERI following the resignation during the year of Dr. Blackwell.

The second study, still in its pilot stage, attempts to establish the effects of age on sight. It is being conducted by Mrs. O. Mortensen Blackwell, wife of the former IERI researcher.

* * *

Dr. Smith's work this year was intended to extend his findings recounted in the previous report -- that lighting levels must be heightened in order to increase the average young adult's ability to see a task of increased complexity.

Dr. Smith spent considerable time during the period covered by this report in designing, building, testing and installing electronic and optical equipment for an "eye-marker" system which would capture and measure the directional movements of the eye on a calibrated television screen. While the television circuit apparently was functioning properly, the instruments measuring the vertical and horizontal movements of the eye needed additional equipment to assure accuracy.



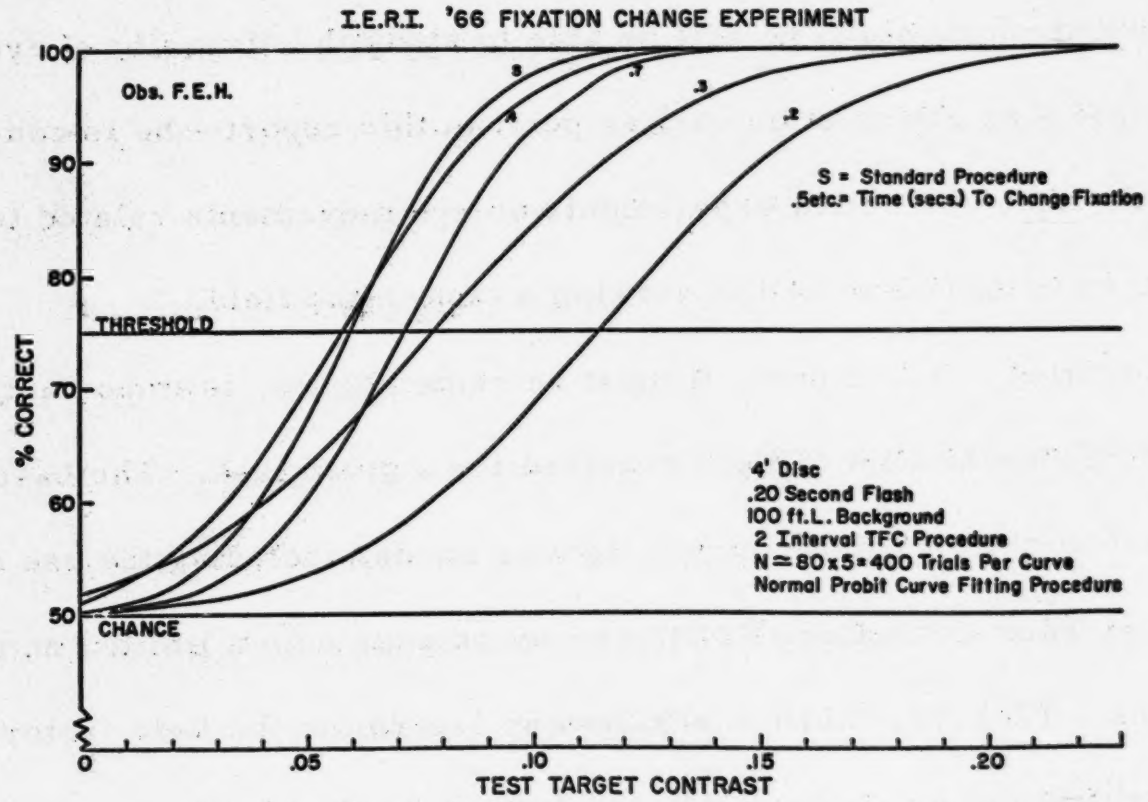
RECORDING EYE MOVEMENTS -- This device helps to differentiate between tasks in terms of the difficulty in seeing them.

These additions are now being made. Meanwhile Dr. Smith reports that requirements have been worked out for the data recording and analysis equipment. Also, possible ways of implementing these data have been established.

While Dr. Smith is deeply involved perfecting his eye-marker equipment through which he will be able to study the diversity of eye movements - as stated at an earlier point in this report - he is continuing to make controlled experiments on eye movements related to dynamic conditions involved in viewing a task in the field.

Attention to movement, it must be remembered, is important in determining the amount of light required for a given task. The basic Blackwell method for determining lighting needs, including the use of the Visual Task Evaluator (VTE), can encompass only a limited number of actions. Thus Dr. Smith's results can determine the field factors for other types of eye movements involved in field activities.

Dr. Smith's controlled experiment on viewing a dynamic task acknowledges the effect of eye-movement and attempts to measure it. His experiment employs three observers who fix their attention on the area described by four orientation dots 10^{o} up to the right of a target on a viewing screen. At an audible signal, a beeper, the observers are required to divert their attention to the target area itself and to a target which flashes for a variable interval. Readings in a succession of such tests have been plotted as curves (see exhibit) and indicate that reduction of the waiting interval between diversion from the fixation to the target results in a decrease in the accuracy in seeing the target. Stated another way, the tests showed that threshold contrast needs to be increased as the time for changing the fixation is lessened. This sharpens the appearance of the test object.



RESEARCHER'S GRAPH illustrates how accuracy is increased or decreased by change of transition time.

* * *

Mrs. Blackwell in the previous report year showed that four characteristics can be recognized usually as a result of the aging process. First, a haze overlays the visible task because scattering in the eye media results in breaking up the light entering the eye. Second, reduced pupil size allows less light to enter the eye for seeing. Third, a degraded optical image results from a reduced ability

EQUIPMENT USED by Mrs. Blackwell (at console) to determine visual performance of older eyes.

to focus. And, fourth, inability to see the task sharply results from reduced ability to fixate.

During the year now being reported, Mrs. Blackwell developed the necessary equipment and the techniques to measure the ocular stray light in observers in the laboratory. A source of disability glare whose effect could be measured had been constructed first.

Although she began her portion of the 1965 project with this equipment and techniques, her work was interrupted by the failure

of the glare source to remain coordinated with the fixation lights. This having been corrected, she was able to make limited progress on one subject during the period under report.

Data from this initial study indicated that glare sources of more than 6 degrees are too small to be measured by the laboratory instrument. Glare sources of 4 and 2 degress, however, produce measurable effects.

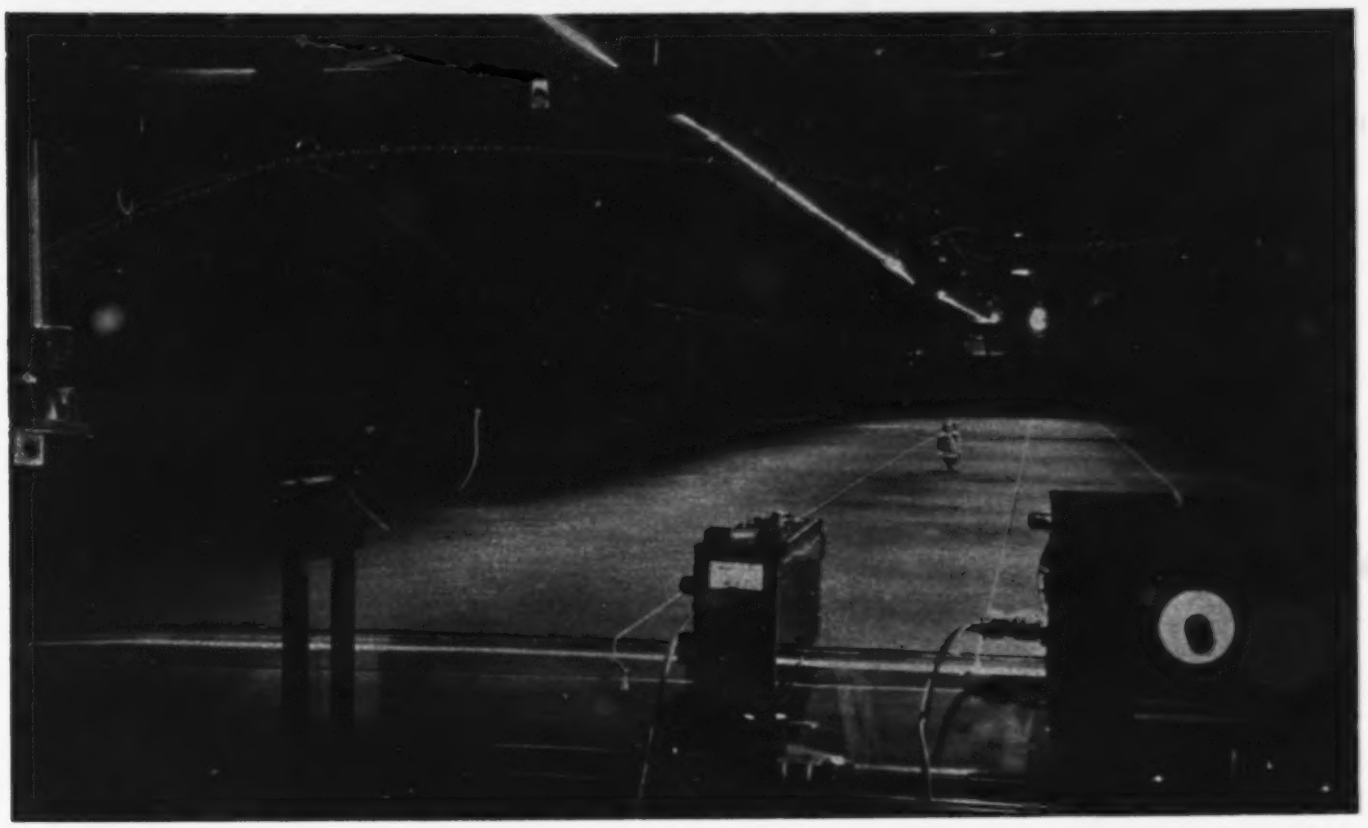
Roadway Visual Tasks

PROJECT 47-65

This project has been delayed because of several unavoidable changes in personnel. Andre Birkhoff, a member of the staff at the Institute for Research in Vision at Ohio State University, developed the equipment for the roadway simulator by June 30, 1965. This installation has been described in earlier reports.

Mr. Birkhoff, however, was unable to secure consistent Visual Task Evaluator readings on the simulated roadway and, before he was able to correct the irregularities, other obligations dictated that he be transferred from this project. Two replacements in succession returned to graduate school or other interests before they were able to apply their newly-gained knowledge of the testing equipment. At this juncture, Mrs. Blackwell took on the assignment.

Mrs. Blackwell has become familiar with the equipment and has made good progress with the continuing research during the past year.



SIMULATED STREET AT OHIO STATE U. LABORATORY is built to scale to determine how much light is needed to see hazardous objects under various lighting arrangements.

Her initial studies convinced her that a new criterion for the VTE was needed. She reasoned that an automobile driver would probably not recognize a slight specular reflection from the hair of a manikin or a semi-specular reflection from the side of the head as an indication that there was an obstruction on the roadway. She concluded that a more realistic criterion must be established to represent the threshold limit at which the driver could realize that an unnatural object was in the roadway.

The new criterion will be applied to the manikins only - the cubes used earlier in this study have been discontinued as test objects - and will involve different elements of the complex light and shadow patterns

of the objects in various physical conditions. Mrs. Blackwell also is convinced that VTE measurements should be made with a variety of lighting systems which represent extremes of the visual environment they produce.

Her recent work on this project indicates that Mrs. Blackwell has been able to extract useful data from these studies.

Color Preference Studies

PROJECT 48

TEST CUBICLE -- Color patches were used against various backgrounds to determine the range of preferences.

Color, light and background, which is the subject of the long-range project that has occupied Dr. Harry Helson, was discussed in depth in the IERI's 1965 report.

Dr. Helson, it will be recalled, gathered 156,250 reactions during his work with ten observers who responded to 125 object colors against 25 background colors under five different illuminants. He is still analyzing these reactions, after having made initial determinations, and is expected to present a full report in the relatively near future.

Glare from Large Sources

PROJECT 59-65

During the past seven years, considerable data have been collected on this project which is a study of discomfort glare from large sources - from windows, luminous ceiling areas and individual luminaires. The

project has been carried on at Cornell University, Ithaca, N.Y., and was begun as a parallel study to that originated at the Building Research Station, Garston, England, by Dr. Ralph Hopkinson, now of the faculty of University College, London.

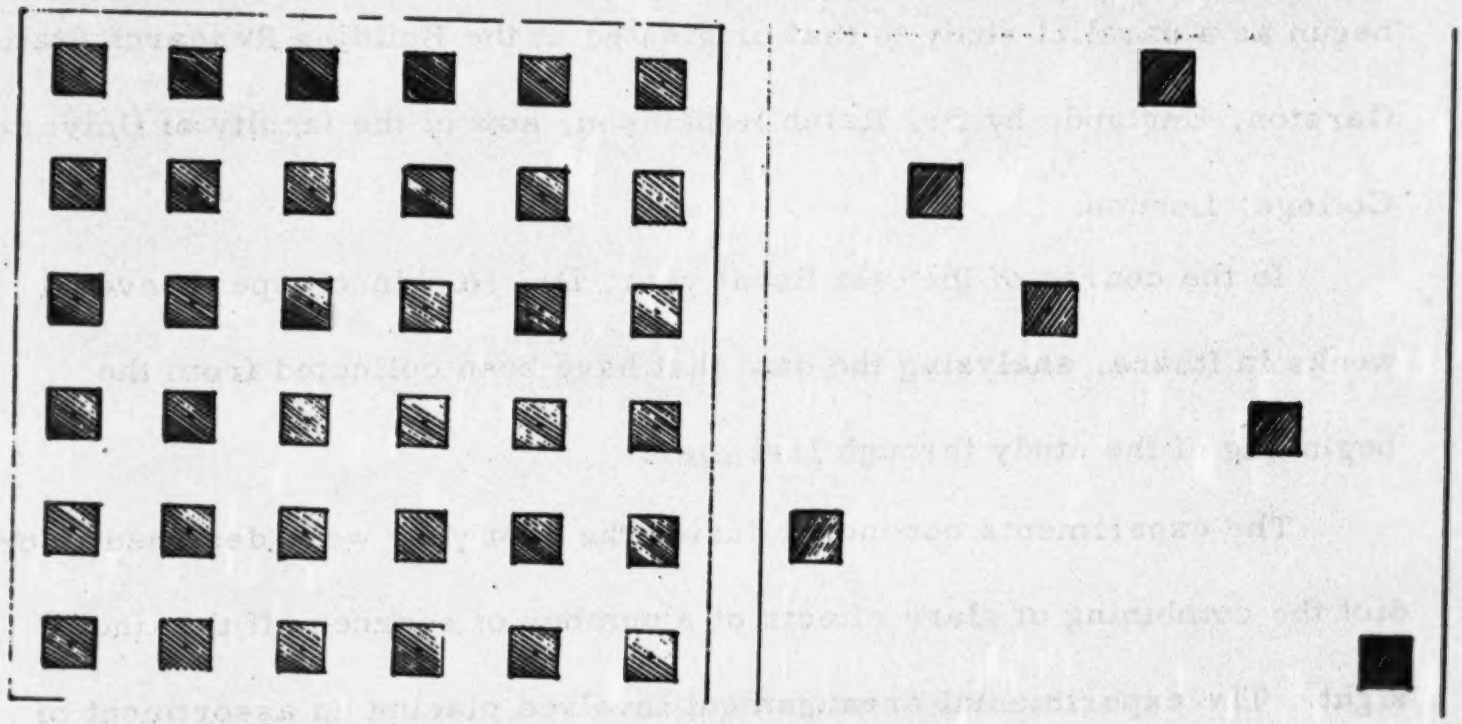
In the course of the last fiscal year, Dr. Hopkinson spent several weeks in Ithaca, analyzing the data that have been collected from the beginning of the study through last year.

The experiments conducted during the past year were designed to predict the combining of glare effects of a number of sources off the line of sight. The experimental arrangement involved placing an assortment of masks over a large source, 4 feet square, in the center of an 8-foot-square wall in an 8-foot-cube viewing room. The 4' x 4' source was considered to have been divided into 36 square areas which could be exposed in several ways, some of which are illustrated here.

In one experiment, each of the 36 square areas had an aperture cut in the center. Other masks were identical in layout but used larger central apertures. Thus the effect of increasing the size of sources could be studied. In another experiment, comparison was made between a symmetrical, evenly-spaced arrangement of small sources and a single central source of the entire area. In other experiments, various asymmetrical arrangements of small sources were investigated.

Prof. Everett M. Strong, who is in charge of the project, is now seeking personnel to analyze the data collected during the last year.

It is possible that Dr. Hopkinson and his associate, W. Collins, will undertake this task shortly.



GLARE FROM A SERIES OF SOURCES -- Patterns that were used to determine the effect of number, size and location of various glare sources as conducted in the Cornell studies.

Discomfort Glare Data Analysis

PROJECT 59 A.S.1&2

Dr. Glenn A. Fry is in the midst of an analysis of research data on discomfort glare.

He is attempting to correlate the findings of Dr. Sylvester Guth at Nela Park, Dr. H. W. Bodmann at Aachen, Germany, Dr. Hopkinson's and a companion study at Cornell University, and other data collected in Czechoslovakia and elsewhere. Work on this project has not yet been completed but, with Dr. Fry, now Regents Professor, State of Ohio, and no longer restricted by administrative duties at the School of Optometry at Ohio State University, completion could be expected soon.

Transitional Adaptation

PROJECT 63-65

During the past year, Dr. Robert M. Boynton continued his studies of the eye's reaction to sudden changes in brightness, up or down. Dr. Boynton, who is professor of psychology and director of the Center for Visual Science at the University of Rochester (N.Y.), has now approached the question of transitional adaptation from three directions.

His first series of studies described in the IERI's 1964 Annual Report examined the eye's ability to see when directed away from a well-lighted task to another viewing task of higher or lesser brightness. Sudden changes, it was developed through these experiments, caused serious immediate losses of vision.

To compensate for losses due to changes in brightness, one must either increase the size of the object or increase the contrast between the object and its background. A 10-to-1 brightness change requires up to 150 percent increase in size or contrast.

The second series (discussed in the Annual Report last year) studied the adaptation problem that developed when the eye, occupied with a viewing task at one brightness level, is diverted quickly to another brightness level (but with no new viewing task) and then quickly returned to the original task. Four levels of brightness were used and the intervals of altered brightnesses were also varied from .04 to 10 seconds. Dr. Boynton found that the effect of small brightness-level changes was not great but that diversions to greater changes in brightness were more serious.

Following these studies, the IERI researcher reported that "it may be concluded that luminances in the environment above 400 ml must be carefully avoided in engineering practice. Below 400 ml, visibility losses produced by transient adaptive effects are relatively small and recovery from them is considerably more rapid." Even for the eye conditioned to the

'RUNNING TAU' EXPERIMENT --This is apparatus to determine time required to find a square in a group of circles. Above, observer views translucent screen which operator (left) illuminates with either high-powered spotlights (top of table) or lower-powered projectors (beneath table). Test objects are thrown on screen by projector between spotlights.

40 ml level, flashes exceeding the 400 ml level are deleterious to vision, it was shown.

In the third series of studies, the eye of the observer was diverted from a viewing task at one brightness to a different task at another brightness. At the new level the eye was required to search for a specific detail among other details. The time required for the search was referred to as the "running tau". Monetary rewards were motivation for the subject's speediest reactions.

The detail sought in the search was a square among a collection of circles. In some instances no square was included. If, after 20 seconds of exposure, no square was reported by the subject (who had merely to press a switch on seeing the detail) his reward was 20 cents. In sequences in which squares were present, the reward for correct responses was 15, 10 and 5 cents, the larger amounts for the shorter reaction times. If the subject reported a detail that was not actually present, he was penalized twice the amount that would have been awarded for the time lapse if a detail had actually been present.

Although all tests have been completed, results have not yet been presented.

The practical significance of the "running tau" test was explained by Dr. Boynton in terms of vision loss on driving into a dark tunnel or similar loss in sudden illumination of a darkened room.

"In the . . . downward shifts," he reported, "the case of driving into a dark tunnel is simulated. The upward case tells us how long it

takes to regain normal vision when the dark-adapted eye suddenly encounters a bright environment, as when the room lights are suddenly turned on following the showing of slides in a dark room."

Standardized Test Objects

PROJECT 70 A.S 4&5

Dr. Blackwell and his team are completing their study of possible standard test objects representing handwriting tasks. Simultaneously the researchers are refining techniques of physical measurement of contrast losses. They are making good progress studying handwriting samples which are made by a new technical device and are, therefore, relatively standardized. These samples are both pencil-dot and dragged handwriting test objects and are used under various light distributions in a testroom 30' x 30' x 10'. Little difference was found in the results of the two tests under a luminous ceiling and two rows of 2'-wide troffers.

The nature of the study is being changed in the future by introducing unusual conditions such as having extreme distributions -- for example, concentrated downlight from reflector lamps, and a luminous wall. From these experiments could come a standardized test object which, with suitable instrumentation, could be taken into the field to measure veiling reflection contrast losses under any lighting system.

ADMINISTRATIVE REPORT

During the 1965-66 period the following personnel administered the activities of the Institute:

Board of Trustees

John W. Ferree, M.D., Chairman
Alfred F. Wakefield, Treasurer
Charles L. Amick
Edwin O. George
William P. Lowell, Jr.
Everett M. Strong
Henry L. Wright

Research Executive Committee

Leonard C. Mead, Chairman
Hedley F. Davidson
Warren H Edman
Glenn A. Fry
Charles D. Gibson
Clarence C. Keller
Roland M. Zabel

In addition, the Technical Advisory Committee on Light and Vision rendered its continuing recommendations and counsel to the Research Executive Committee and Trustees in planning the program reviewing progress reports on each project and proposals for continuing and new research. The personnel of this Committee was as follows:

Dr. Glenn A. Fry, Chairman
Mr. Willard Allphin
Charles J. Campbell, M.D.
Dr. Sylvester K. Guth
Mr. John J. Neidhart
Mr. Benjamin H. Evans
Prof. Everett M. Strong

The Research Executive Committee and the Technical Advisory Committee on Light and Vision held two meetings each, one of which was a joint meeting to review progress; the others were concerned with consideration of proposals and recommendations to the Trustees.

The Finance Committee, consisting of representatives from IERI and I.E.S., met to review progress, to study the material presented before the Development Committee, to review the objectives of the Society in supplying $100,000 for the IERI program and to explore any possibility

of reaching this goal. It appeared to the Society representatives the goal would be unobtainable in the foreseeable future. Suggestions were made that foundations or similar agencies would be the only possible source of funds to meet this goal.

The Development Committee met twice, accomplishing much during the year. In November, 1965, the members considered the impact of the research program on improved illumination for better visibility. This has resulted in increasing acceptance by the public and, in turn, increasing business in the lighting industry. Further, they considered the research basis of the new Certified Study Lamp program.

In May, 1966, the Development Committee felt that the research program had resulted in much benefit for such little investment and that it was time to work out a program of increased support that would allow amplifying research coverage. This was done during the summer. In September Chairman R. G. MacDonald met with the Board of Trustees for its approval of a proposed plan of setting a goal of $250,000 per year and 4-1/2 mils per meter for public utilities to be given directly to IERI for the amplified program. This was approved. The Illuminating Engineering Society Council later agreed to the Development Committee carrying out this plan.

The Board of Trustees reviewed the summary reports of three research projects, approved proposals on each for consideration, and proposed contracts as follows:

Project #30-66 - "Studies of Visual Performance",
Ohio State University

Project #47-66 - "Studies of Illumination Requirements for Roadway Visual Tasks", Ohio State University

Project #63-66 - "Transitional Adaptation", University of Rochester

The usual Project 59 ("Discomfort Glare from Large Area Sources", Cornell University) could not be continued at Cornell due to the forthcoming retirement of Professor E.M. Strong; therefore, negotiations were initiated with Dr. Mason Crook and associates at Tuft University for possible transfer of the Cornell equipment for continued study. In the meantime, Dr. R.G. Hopkinson of University of London, who had been associated from its beginning, was induced to come and work with William Atkinson to analyze the results of the study. This report has been prepared and is being processed through the review channels. This report does not include the multi-glare source work of Atkinson during 1965-66. This will be analyzed later.

During the year, two IERI Newsletters were distributed to a mailing list of over 1200. These covered the growth of illumination levels and lighting equipment sales since 1958, due primarily to research -- a rise which exceeded the GNP rate -- and the virtues of the new Better Light Better Sight study Lamp, especially its reduction of veiling brightnesses; the Development Committee meeting in Columbus; H. Richard Blackwell's resignation and the appointment of Stanley W. Smith as successor; glare researcher Hedly Davidson's death; Walter Bouldin's election as a member of the Development Committee, and the status of researchers' studies.

As Secretary of the Institute, Mr. C. L. Crouch was invited to speak to the British Biannual Conference at Harrogate. He presented a paper entitled "Working and Living in a Luminous Environment" which described the concept of becoming knowledgeable about the impact of the total environment on the "whole man". The paper placed particular emphasis on luminous environment and examined effects from the thermo and sonic relationships. In this paper, he described the effect of the results of the research program upon everyday lighting design.

During his trip abroad he visited vision and research laboratories at Eindhoven, The Netherlands, and Karlsruhe, Germany. He also made preliminary arrangements for the International Symposium on Light and Vision to be held in 1967 at Columbus, Ohio.

The Secretary also had the opportunity to present a description of the research program before the Building Research Institute's Spring meeting, May, 1966, at Washington, D. C. and its effect on the design of illumination for buildings.

FINANCIAL REPORT

(As of September 1, 1966)

Balance on hand as of 9/30/65				$25,564.29
Receipts - Illuminating Engineering Society				60,000.00*
Photo Research Corporation				2,500.00
IERI Proceedings, 1960 sale of				3.00
Interest - Chase Manhattan Savings Account (as of 5/31/66)				104.06
				$88,171.35
Disbursements -				
Projects	1965-66	Budget	Pd. in 1965-66	
30-65 Smith	Visual Perf.	23,820	11,910	
47-65 Birkhoff	Roadway	1,680		
59-65 Atkinson	Discomfort Glare	16,320	16,320	
63-65 Boynton	Transit. Adapt.	12,036	12,036	
			40,266**	
	1966-67			
30-66 Smith	Visual Perf.	25,912	12,956	
47-66	Roadway			
59-66 Atkinson	Discomfort Glare			
63-66 Boynton	Transit. Adapt.	22,660		
78-66 O'Brien	Veiling Reflect.	3,000	3,000	
			15,956	
Accessory Services		2,000	1,000	
59AS-2 $500				
70AS-4 500				
Non-Project Expenses		2,000	3,129.54	
Travel - RX-TA Committees				
Administrative Expenses				
Public Information (including PI consultant fees & expenses, Annual Report, Newsletters)		3,500	4,350.78	
IERI Booklet		1,500		
Secretary's travel		1,500	1,434.44	
Auditing		150	90.00	
Services, stationery, photos, slides, charts, bonding		1,466	1,300.67	
		8,116	7,175.89	67,527.53
Balance on hand as of 9/1/66				20,643.82
Allocations (to Sept. 30, 1966)				
Accessory Services		1,000.00		
Administrative Expenses		1,724.11		
Projects		11,330.00		
		14,054.11		

* $10,000 - additional contributed services from IES

** $13,590 - was paid on 1964 contracts in previous fiscal year, making a total of $53,856.00

ILLUMINATING ENGINEERING

Research Institute

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1966-1967

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